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A checklist of black flies (Diptera, Simuliidae) from India

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Abstract

An updated checklist of the family Simuliidae from India is presented. A total of 79 species of *Simulium* belonging to eight different subgenera are listed. Eleven species that were not reported in the previous checklist are added here. The present list contributes to a better understanding of the diversity of Simuliidae in India, as well as the impact of *Simulium* species on the public health of this mega-diverse country.

Keywords

Diversity, inventory, onchocerciasis, public health

Introduction

Black flies (Diptera, Nematocera, Simuliidae) are infamous as vectors for transmitting onchocerciasis (river blindness) in many countries throughout the world (Datta 1997). However, in India, onchocerciasis is still not a serious concern despite some sporadic cases in North-east India (Barua et al. 2011). The total number of simuliid species throughout the world is estimated to be 2,415, of which 2,398 species are living and 17 are fossil species (Adler 2022). An inventory of world Simuliidae was first published by Crosskey (1988) and has since been updated almost every year. The beginning of simuliid research was in the early 19th century when Latreille (1802) described *Simulium* Latreille, 1802. The family Simuliidae Newman, 1834 was established by Newman (1834) with the inclusion of only the genus *Simulium*. According to Mitra et al. (2017), the first description of *Simulium* from India was probably by Becher (1885), and since then, researchers have described new species of simuliids

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from the country (Brunetti 1911; Senior-White 1922a, 1922b; Edwards 1927; Puri 1932a, 1932b, 1932c, 1932d, 1932e, 1933a, 1933b, 1933c). In the second half of the 20th century, the simuliid research was mainly undertaken by Datta (1973, 1974a, 1974b, 1975, 1978, 1980, 1983, 1985, 1992a, 1992b, 1997). He extensively studied the Indian simuliid fauna, described several new species of *Simulium*, and provided new distributional records. His review of the family in the Oriental realm (Datta 1983) is an exceptional piece of work in its understanding of the biology of black flies. Datta and Pal (1975); Datta et al. (1975) described a few additional rare species of the subgenus *Simulium*, especially from the Darjeeling area of West Bengal state, and provided taxonomic identification keys to simuliid species found in that region. Later, in the 21st century, several researchers discovered many new species (Mitra et al. 2006; Takaoka and Somboon 2008; Shrestha and Takaoka 2009; Mitra and Sharma 2010; Takaoka et al. 2010, 2011; Henry et al. 2011; Borah et al. 2012; Dutta Saha et al. 2012; Anbalagan et al. 2014, 2015a, 2015b). The first checklist of Simuliidae of India was published by Mitra et al. (2017). The most recent publications are by Anbalagan et al. (2020a, 2020b) in which they described three new species of the *Simulium*—two in the subgenus *Gomphostilbia* and one in the subgenus *Nevermannia*.

The present work documents 79 species of Simuliidae belonging to eight subgenera of *Simulium*, based on a review of the World Catalog of Simuliidae (Adler 2022) and other literature. The binomial names are based on the valid nomenclature of Systema Dipterorum (Evenhuis and Pape 2022). Eleven species have been added here to those species already included in the earlier checklist of Indian Simuliidae by Mitra et al. (2017). The inclusion of these previously unreported species will help us to better understand the taxonomy and diversity of the black flies in India. It will also lead to the assessment of the newly reported species as potential vectors of onchocerciasis in India.

Results

Order Diptera Linnaeus, 1758
Infraorder Culicomorpha Hennig, 1948
Superfamily Chironomoidea Newman, 1834
Family Simuliidae Newman, 1834
Subfamily Simulinae Newman, 1834
Tribe Simuliini Newman, 1834
Genus *Simulium* Latreille, 1802

Subgenus *Eusimulium* Roubaud, 1906

1. *Simulium* (*Eusimulium*) *aureum* Fries, 1824
2. *Simulium* (*Eusimulium*) *weiningense* Chen & Zhang, 1997

Subgenus *Gomphostilbia* Enderlein, 1973

3. *Simulium* (*Gomphostilbia*) *bucolicum* Datta, 1975

4. *Simulium* (*Gomphostilbia*) *darjeelingense* Datta, 1973
5. *Simulium* (*Gomphostilbia*) *fidum* Datta, 1975
6. *Simulium* (*Gomphostilbia*) *litoreum* Datta, 1975
7. *Simulium* (*Gomphostilbia*) *metatarsale* Brunetti, 1911
8. *Simulium* (*Gomphostilbia*) *pattoni* Senior-White, 1922
9. *Simulium* (*Gomphostilbia*) *sundaicum* Edwards, 1934
10. *Simulium* (*Gomphostilbia*) *tenuistylum* Datta, 1973
11. *Simulium* (*Gomphostilbia*) *unum* Datta, 1975
    In the revised inventory of Adler (2022), this species was documented from Java (Indonesia) and Malaysia. However, Datta (1991) reported its occurrence in the Bankura and Purulia districts (23°14'28.7"N, 87°3'42.6"E and 23°19'57.1"N, 86°21'46.8"E) in West Bengal, India. It was not included in Mitra et al.'s (2017) checklist.
12. *Simulium* (*Gomphostilbia*) *agasthyamalaiense* Vijayan, Anbalagan, Rekha, Dinakaran & Krishnan, 2019
    This species was described by Vijayan et al. (2019) from reared pupa collected in Agasthyamalai Biosphere Reserve, Tamil Nadu (8°55'4.1"N, 77°36'1.6"E), India.
13. *Simulium* (*Gomphostilbia*) *barnesi* Takaoka & Suzuki, 1984
14. *Simulium* (*Gomphostilbia*) *cauveryense* Anbalagan, 2015
15. *Simulium* (*Gomphostilbia*) *decuplum* Takaoka & Davies, 1995
16. *Simulium* (*Gomphostilbia*) *dinakarani* Anbalagan, 2020
    This species was described by Anbalagan et al. (2020a) and occurs in Tamil Nadu (10°27'30.7"N, 78°01'15.7"E), India.
17. *Simulium* (*Gomphostilbia*) *kottoorense* Anbalagan, 2015
18. *Simulium* (*Gomphostilbia*) *krishnani* Anbalagan, 2020
    This species was reported from Karnataka (14°58'36"N, 74°46'40"E), India, by Anbalagan et al. (2020a).
19. *Simulium* (*Gomphostilbia*) *kumbakkaraiense* Anbalagan, 2019
20. *Simulium* (*Gomphostilbia*) *panagudiense* Anbalagan 2015
    This species was recently described by Anbalagan et al. (2019) with distributional records in Tamil Nadu (10°18'30.3"N, 77°53'35.8"E), India.
21. *Simulium* (*Gomphostilbia*) *parahiyangum* Takaoka & Sigit, 1992
22. *Simulium*(*Gomphostilbia*) *peteri* Anbalagan, 2014
23. *Simulium* (*Gomphostilbia*) *sachini* Takaoka & Henry, 2010
24. *Simulium* (*Gomphostilbia*) *takaokai* Anbalagan, 2014
25. *Simulium* (*Gomphostilbia*) *williei* Takaoka & Thapa, 2010

Subgenus *Montisimulium* Rubstov, 1974

26. *Simulium* (*Montisimulium*) *dasguptai* Datta, 1974
27. *Simulium* (*Montisimulium*) *dattai* Takaoka & Somboon, 2008
28. *Simulium* (*Montisimulium*) *ghoomense* Dutta, 1973
29. *Simulium* (*Montisimulium*) *nemorivagum* Datta, 1973
30. *Simulium* (*Montisimulium*) *yuntaiense* Chen, Wen & Wei, 2006

Subgenus *Nevermannia* Enderlein, 1921

31. *Simulium* (*Nevermannia*) *aureohirtum* Brunetti, 1911
32. *Simulium* (*Nevermannia*) *gracilis* Datta, 1973
33. *Simulium* (*Nevermannia*) *karavalliense* Anbalagan, Rekha, Vijayan, Balachandran, Dinakaran & Krishnan, 2020
    This species was reared from pupae collected in Tamil Nadu (11°20'03.8"N, 78°19'19.6"E), India and described by Anbalagan et al. (2020b).
34. *Simulium* (*Nevermannia*) *praelargum* Datta, 1973
35. *Simulium* (*Nevermannia*) *purii* Datta, 1973
36. *Simulium* (*Nevermannia*) *rufithorax* Brunetti, 1911
37. *Simulium* (*Nevermannia*) *senile* Brunetti, 1911
38. *Simulium* (*Nevermannia*) *subratai* Takaoka, Thapa & Henry, 2011
39. *Simulium* (*Nevermannia*) *wichaii* Takaoka, 2010

Subgenus *Tetisimulium* Rubtsov, 1960

40. *Simulium* (*Tetisimulium*) *stevensoni* Edwards, 1927

Subgenus *Himalayum* Lewis, 1973

41. *Simulium* (*Himalayum*) *indicum* Becher, 1885

Subgenus *Simulium* Latreillie, 1802

42. *Simulium* (*Simulium*) *alajense* Rubtsov, 1938
43. *Simulium* (*Simulium*) *asishi* Datta, 1985
44. *Simulium* (*Simulium*) *adventicium* Datta, 1985
45. *Simulium* (*Simulium*) *barraudi* Puri, 1932
46. *Simulium* (*Simulium*) *biforaminiferum* Datta, 1974
47. *Simulium* (*Simulium*) *consimile* Puri, 1932
48. *Simulium* (*Simulium*) *christophersi* Puri, 1932
49. *Simulium* (*Simulium*) *dentatum* Puri, 1932
50. *Simulium* (*Simulium*) *digitatum* Puri, 1932
51. *Simulium* (*Simulium*) *ephemerophilum* Rubstov, 1947
52. *Simulium* (*Simulium*) *gravelyi* Puri, 1933
53. *Simulium* (*Simulium*) *griseifrons* Brunetti, 1911
54. *Simulium* (*Simulium*) *grisescens* Brunetti, 1911
55. *Simulium* (*Simulium*) *gurneyae* Senior-White, 1922
56. *Simulium* (*Simulium*) *himalayense* Puri, 1932
57. *Simulium* (*Simulium*) *hirtipannus* Puri, 1932
58. *Simulium* (*Simulium*) *howletti* Puri, 1932
59. *Simulium* (*Simulium*) *kapuri* Datta, 1975

60. *Simulium* (*Simulium*) *lineothorax* Puri, 1932
61. *Simulium* (*Simulium*) *nigrifacies* Datta, 1974
62. *Simulium* (*Simulium*) *nilgiricum* Puri, 1932
63. *Simulium* (*Simulium*) *nitidithorax* Puri, 1932
64. *Simulium* (*Simulium*) *novolineatum* Puri, 1933
65. *Simulium* (*Simulium*) *nodosum* Puri, 1933
66. *Simulium* (*Simulium*) *pallidum* Puri, 1932
67. *Simulium* (*Simulium*) *palmatum* Puri, 1932
68. *Simulium* (*Simulium*) *palniense* Puri, 1932
69. *Simulium* (*Simulium*) *pradyai* Takaoka & Somboon, 2008
70. *Simulium* (*Simulium*) *pothigaiense* Anbalagan, 2018
71. *Simulium* (*Simulium*) *ramosum* Puri, 1932
72. *Simulium* (*Simulium*) *rashidi* Lewis, 1973
73. *Simulium* (*Simulium*) *rufibasis* Brunetti, 1911
74. *Simulium* (*Simulium*) *singtamense* Datta & Pal, 1975
75. *Simulium* (*Simulium*) *striatum* Brunetti, 1912
76. *Simulium* (*Simulium*) *tenuitarsus* Puri, 1933
77. *Simulium* (*Simulium*) *valparaiense* Anbalagan, 2018
78. *Simulium* (*Simulium*) *yanaense* Anbalagan, 2019
    This species was described from Karnataka (14°31'19.2"N, 74°19'12"E), India by Anbalagan et al. (2019).

Subgenus *Wilhelmia* Enderlein, 1921

79. *Simulium* (*Wilhelmia*) *pseudequinum* Séguy, 1921

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